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Improvement in Neurogenic Pain with Epidural Injections Following Interspinous Spacer Implantation in Patients with Lumbar Stenosis: A Case Series

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Background: Lumbar spinal stenosis with neurogenic claudication can be a debilitating condition, affecting quality of life. Interspinous spacer implantation is a minimally invasive procedure for treatment of lumbar spinal stenosis with neurogenic claudication and associated symptoms by minimizing spinal extension and therefore neural compression.

Case Presentation: This case series presents 4 cases of patients with multilevel stenosis, most radiographically severe in the lumbar region, all who received interspinous spacers at L3-4 and L4-5 after minimal improvement in symptoms with conservative management including epidural injections. In all 4 cases, patients reported improved standing and gait but limited improvement in pain and overall function after interspinous spacer implantation. Each patient underwent repeat epidural injections at or below the level of the interspinous spacer with significant improvement in pain for up to 6 months.

Conclusion: Our conclusion is that either postspacer epidural injections helped reduce inflammation associated with the implantation procedure, or the spacer maintained an open space to allow the injectate to permeate areas with the most stenosis and help reduce inflammation and therefore pain.

Key words: Epidural injection, interspinous process decompression, interspinous spacer, interspinous spacer implant, low back pain, lumbar spinal stenosis, neurogenic claudication, spinal stenosis

BACKGROUND

Lumbar spinal stenosis (LSS) is a major cause of pain and disability, as well as the primary reason for spinal surgery in patients 65 years of age and older (1). Neurogenic claudication and low back pain are the most common presenting symptoms in patients with LSS (2). Although neurologic examination may remain normal, some patients exhibit motor weakness and sensory loss in one or more nerve root distributions. Additionally, functional deficits such as gait abnormalities may also be present. In the majority of patients, magnetic resonance imaging (MRI) typically reveals degenerative

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compromise of the central canal, lateral recess, and/or neural foramina leading to stenosis (3). This narrowing has been shown to compress the nerve roots and to be exacerbated with lumbar extension (4). Thus, symptoms may typically be elicited on physical examination with lumbar extension (5).

The goals of management in patients with LSS are pain relief and functional improvement. Treatment typically begins conservatively with medical management, including oral analgesics and anti-inflammatory agents, in addition to physical therapy. In patients with persistent symptoms, epidural steroid injections may be considered prior to surgical referral (6). Decompressive laminectomy with or without fusion is an elective procedure and the most frequently utilized approach for LSS. It is typically reserved for patients who fail conservative management. However, patients may be poor surgical candidates or refuse invasive decompression surgery altogether.

Interspinous spacer implantation is a minimally invasive, indirect decompression treatment option available for patient with LSS and symptomatic neurogenic claudication without evidence of spondylolisthesis (7,8). Under fluoroscopic guidance, the device is implanted between the spinous processes at one or 2 levels; implantation can be performed under local and intravenous sedation anesthesia and as a same-day procedure (9). Additionally, it has been shown to have faster procedural time with less blood loss compared to surgery (10). Studies have shown symptomatic relief and improvement in disability after implantation, maintained at 2-, 4-, and 5-year follow-ups (11-14). Furthermore, decompression with an interspinous spacer is associated with a reduction in opioid use (15).

In some cases, patients may have less than expected improvement after the procedure for a variety of reasons. In this limited case series, we discuss 4 cases of patients with interspinous spacer implantation with minimal pain relief and their subsequent responses to postimplant epidural injections. We also discuss the possible mechanisms of these responses and potential options for future management.

CASE SERIES

This is a limited case series of 4 patients with a history of lumbar spinal stenosis with neurogenic claudication. All 4 patients initially presented with complaints of low back pain and subjective symptoms of neurogenic claudication including difficulty with standing and ambulation. On examination, patients reported exacerbated low back and radicular pain with lumbar extension and straight leg test. They were also noted to have wide-based gait and difficulty with sit-to-stand. All 4 patients subsequently underwent MRI of the spine and met the criteria for the diagnosis of lumbar spinal stenosis with the most severe stenosis observed at the L3-4 and L4-5 levels (Fig. 1).

The 4 patients underwent 6 months or more of conservative management, which included combinations of oral nonsteroidal anti-inflammatory drugs and neuropathic medications. Additionally, they were referred for physical therapy, which was geared towards general strengthening exercises and conditioning. This was followed by a combination of interlaminar, caudal, and transforaminal epidural injections based on symptoms at examination and in concordance with the MRI findings. There was up to 50% improvement in neurogenic pain for up to 2 months; however, this decreased to as low as 20% despite repeat epidural injections.

All patients were then given the option of interspinous spacer placement at the L3-4 and L4-5 levels, which were done under live fluoroscopic guidance. All 4 patients tolerated the procedure well with no complications noted after implantation. Post implant, all patients reported significant functional improvement in standing and gait. In one case, a 100% improvement in neurogenic claudication was seen for 10 days; however, this declined to 30% at 3 months' follow-up. In the other cases, patients were noted to have improvement in pain up to 50% for up to 3 months.

All 4 patients underwent epidural injections at or below the level of the interspinous implant. There was 100% improvement in neurogenic pain for up to 6 months in one case with interlaminar epidural injection at L5-S1. In a second case, an 80% improvement was seen for 3 months following bilateral transforaminal epidural injection at L4-5. In the remaining 2 cases, no change was seen with interlaminar epidural injections at L5-S1; however, up to 60% improvement was seen following bilateral transforaminal epidural injections at L4-5 for up to 6 months. Functional improvement was maintained throughout this period.

DISCUSSION

Interspinous spacer implants are typically placed at the stenotic vertebral levels. The device acts by maintaining intervertebral height and minimizing lumbar extension at these levels. This, in turn, prevents further

Fig. 1. MRI sagittal views of normal (left) vs stenotic lumbar spine (right; red arrow).

narrowing of the stenotic regions in the central canal and neural foramina with reduction in subsequent neural compression.

This case series has demonstrated improvement in symptoms of neurogenic claudication with epidural steroid injections after implantation of interspinous spacer devices in patients with persistent symptoms. This is likely explained by 2 potential mechanisms. First, the implant maintained an open space to allow the injectate to permeate areas with the most stenosis (Figs. 2 and 3). Lumbar spinal stenosis can result from the narrowing of various structures including the central canal, lateral recess, and neural foramen. Narrowing of the lateral recess and neural foramen can give rise to symptoms of neurogenic claudication as mechanical compression and nerve root ischemia occurs. Central canal narrowing can also lead to increased intrathecal pressure resulting in indirect compression of the nerve roots. Extension of the lumbar spine can further narrow these regions, which can exacerbate neural compression. It is possible that by limiting extension, the interspinous spacer allows the injectate to more readily enter the stenotic regions and act on the irritated nerve roots.

A second explanation is that the postimplant epidural injection helped reduce inflammation associated with the implantation procedure itself. It is important to consider that the procedure may have irritated the nerves in stenotic areas, as some manipulation of the spine and surrounding tissue is expected. Repeat epidural injections to these areas may have reduced any inflammation brought about by implantation of the spacer. In both cases, repeat postimplant epidural injection has shown efficacy in further reducing symptoms of neurogenic claudication.

CONCLUSION

In conclusion, we present a series of cases in which patients with persistent neurogenic claudication have demonstrated improved responses to epidural steroid injections after interspinous spacer implantation. This is likely attributed to the spacer allowing the injectate to permeate stenotic areas and/or reducing postprocedure inflammation. Postimplant epidural steroid injections should be considered in patients with persistent symptoms. Furthermore, additional studies should be performed to further investigate possible mechanisms and responses to epidural steroid injections following interspinous spacer implantation.

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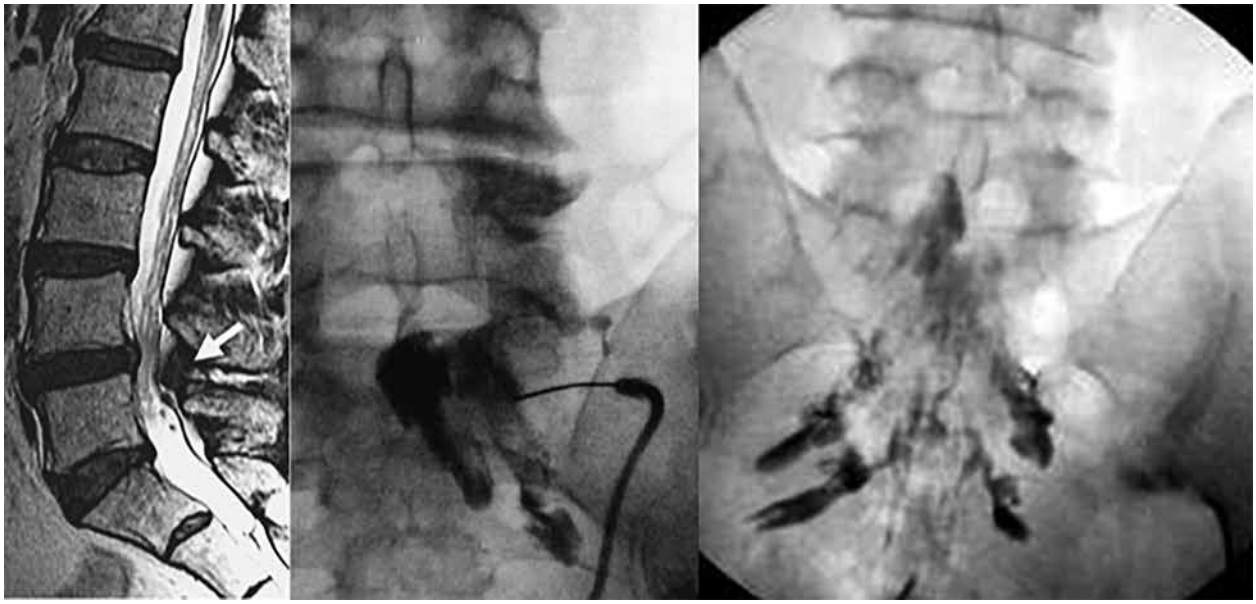

Fig. 2. MRI sagittal view of a stenotic lumbar spine (left). Preimplant fluoroscopic epidurogram AP views of the lumbar region with contrast medium (middle and right). Note the limited superior spread near the stenotic regions with interlaminar and caudal approaches.

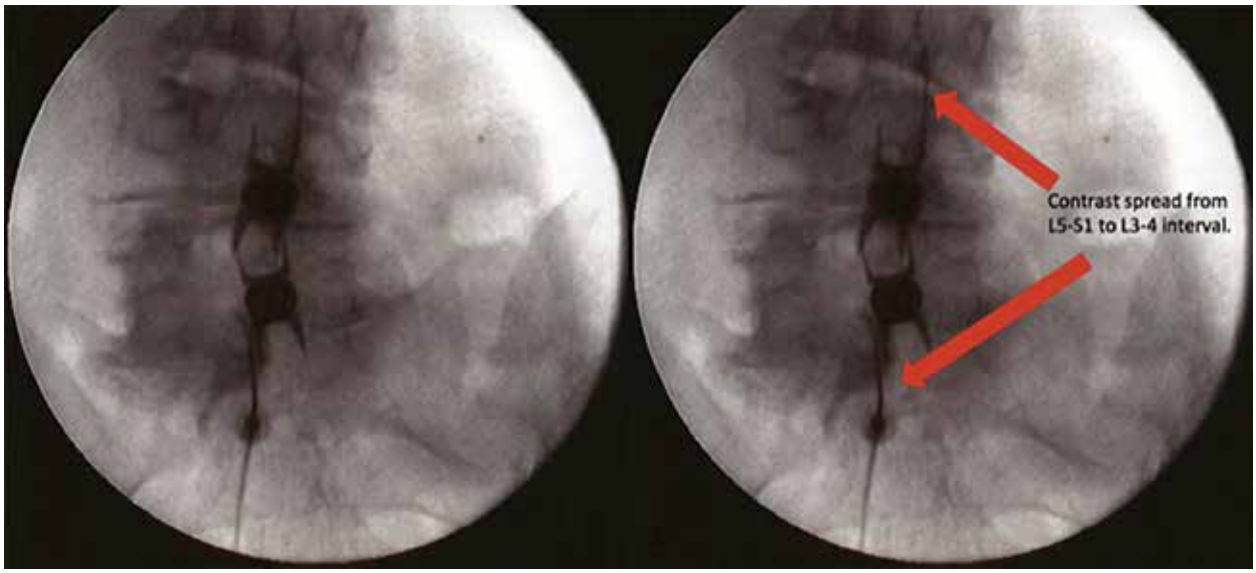

Fig. 3. Postimplant fluoroscopic epidurogram AP views of the lumbar spine with contrast medium. Note the increased superior spread of contrast medium (right; red arrows).

Abbreviations: AP, anteroposterior; MRI, magnetic resonance imaging.

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