The value of the nerve root sedimentation sign in diagnosing lumbar spinal stenosis

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COMMENT & ANALYSIS

The US Centers for Medicare & Medicaid Services, in a 2013 review of lumbar spinal stenosis, state there is no consensus and only insufficient evidence for the definition of lumbar spinal stenosis or the accuracy of diagnostic tests, including which clinical signs and symptoms originate from lumbar spinal stenosis[1]. However, there is growing evidence that the "nerve root sedimentation sign" (SedSign) could aid the diagnosis of the condition. Markus Melloh and Thomas Barz, who invented the SedSign, review the evidence base for this prospective diagnostic tool

Despite a justified critique by Haig[2] of MRI, in which he wrote that "simply ordering an MRI is no more useful than ordering a pizza" and "the most sensitive test for lumbar stenosis may be the presence of an opposable thumb", the imaging modality is still indicated for the diagnosis and differential diagnosis of patients with neurogenic claudication. In 2010, Barz and Melloh *et al* published their observations of a phenomenon seen on MRI scans in the supine position of patients with lumbar spinal stenosis[3]—they found that nerve roots did not follow gravity but remained in the ventral and central part of the dural sac. In contrast, patients without lumbar spinal stenosis showed lumbar nerve root sedimentation to the dorsal part of the dural sac. The authors named this phenomenon the "nerve root sedimentation sign" (SedSign) and defined absence of sedimented nerve roots as a positive sign.

The evidence base for the SedSign

Since its introduction, a further six studies on the SedSign have been published[4–9]. Another study, on data from the Spine Patient Outcomes Research Trial (SPORT), is currently under review. Apart from the inventors' proof-of-concept study[9], all related studies have been retrospective—with one study comparing four groups (lumbar spinal stenosis/low back pain/vascular claudication/asymptomatic controls) and another study comparing three groups but most compared two groups.

In these studies (aside from the proof-of-concept study), sample sizes have varied from 71 to 444 patients and three studies (including SPORT) have provided follow-up data. All studies investigated the potential diagnostic value of the SedSign, with four of them focusing on its potential as an aid for indicating surgery.

Six of the studies have reported SedSign sensitivity as approximately 90% but specificity has generally not been reported. Four studies stated an interobserver reliability of around 90%, but intraobserver reliability was only reported by two studies (with one study[3] showing an intraobserver reliability of 1.0). Also, the studies showed that a positive SedSign was associated with multilevel lumbar spinal stenosis and a three-fold higher epidural pressure at the stenosis level compared with patients without lumbar spinal stenosis and a negative SedSign. According to unpublished data from SPORT, in patients with a positive SedSign surgical treatment was associated with significant larger improvements in function compared with non-surgical treatment.

The use of the SedSign in determining the management of patients with lumbar spinal stenosis

Evidence from these eight studies (the seven published studies and the ongoing SPORT study) suggests that the SedSign could be useful as an add-on tool for surgical decision-making in lumbar spinal stenosis. The inventors of the SedSign believe it is a simple, reliable, and cost-effective indicator of lumbar spinal stenosis with significant advantages compared to solely assessing the cross-sectional area of the dural sac[10,11]. Furthermore, use of the SedSign is fast, does not require taking additional measurements, and demonstrates the stenosis in a way that can easily be explained to the patient. It additionally provides supplementary information to other diagnostic tests and could help in identifying patients who may benefit from decompression surgery. However, further research is required—incorporating both testing and treatment—to determine how specifically the SedSign predicts treatment outcomes and identifies which segmental levels to include in decompression surgery[12,13].

Looking to the future, patients might benefit from an additional tool recently described by Barz Melloh *et al* and further developed with co-inventor Raoul Hecker. Epidural pressure measurement at stenosis level might improve the diagnostic accuracy in lumbar spinal stenosis compared with using MRI and clinical examination alone. This technique could be used before or during surgery helping to identify which segments require decompression.

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3. Barz and Melloh *et al Spine*. 2010; 35: 892¬–97
4. Kim *et al. J Korean Soc Spine Surg* 2011; 18:117–22
5. Macedo *et al. Spine* 2013; 38: 827–31
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Spine needle insertion is not easier when patients are squatting

According to a study published in *Anesthetia Pain Medicine*, in patients receiving elective spinal anaesthesia, spine needle insertion was not easier when the patient was in a squatting position rather than in the traditional sitting position. However, the total number of spine needle bone contacts was significantly lower in the squatting position than in the sitting position

Sussan Soltani Mohammadi (Department of Anesthesiology, Dr. Shariati Hospital, Tehran University of Medical Sciences, Tehran, Iran) and others write that reducing lumbar lordosis during initiation of neuraxial block could help to identify the spinal space and reduce the number of spinal needle bone contacts. They add that lumbar lordosis could be reduced during the administration of spinal anaesthesia if a patient was in squatting position rather than in the traditional position, describing the squatting position as "the patient squats while his or her buttock and plantar surfaces of the feet are supported by the operating table and the patient hugs his or her knees."

The aim of their study was to compare spinal anaesthesia administered when a patient was in a squatting position with when a patient was in the sitting position, with the goal of minimising needle bone contact and improving ease of insertion/space identification.

Mohammadi *et al* randomised 236 patients, who were due to undergo elective lower abdominal or lower extremity surgery, to receive spinal anaesthesia in a squatting position (118) or in a sitting position (118). The total number of bone contacts was statistically lower in the squatting position group compared with the sitting position group (222 vs. 230, respectively; p=0.01). However, the authors add: "Insertion of needle was easy in 97 (87%) and 94 (84%) of patients and difficult in 20 (18%) and 17 (15%) of patients in the traditional sitting and squatting positions, respectively (p=0.59 and p=0.12)."

They comment the fact that there was no difference in space identification or needle insertion between the groups despite the fact that the squatting position reduced lumbar lordosis may be due to the squatting position "inducing tension in the supraspinous ligament".