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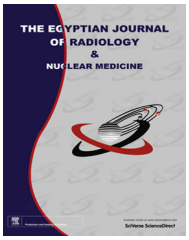

REVIEW

The MRI finding of the nerve root sedimentation sign: Its clinical validity and operative relativity for patients with lumbar spinal stenosis

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KEYWORDS

Lumbar spinal stenosis;
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Abstract *Background:* Lumbar spinal stenosis (LSS) is increasingly being recognised as a cause of disabling low back and lower extremities pain in adult population. Advanced spinal imaging thought as confirmation tool for the diagnosis and as preoperative tool to delineate the extent and precise location of the pathology. Nerve roots normally sediment, due to gravity, to the dorsal part of the dural sac, which was known as negative sedimentation sign. If there is MRI finding of nerve roots in the ventral part of the dural sac the sedimentation sign is positive.
Objectives: To evaluate the presence of the MRI finding of positive sedimentation sign in patients clinically suspected to have lumbar spinal stenosis and to follow up operated cases to identify the absence of the radiological signs in the operated cases.
Material and methods: 70 patients clinically suspected to have lumbar spinal stenosis evaluated by MRI lumbosacral spine in supine position. A panel of two radiologists reviewed radiological data. MRI features were agreed by both radiologists in 48 patients. Out of these 48 patients; 25 were operated upon for central decompressive laminectomy, partial medial facetectomy and foraminotomy with instrumented fusion and fixation if indicated. Visual analogue score (VAS) collectively preoperative and postoperative was compared and the walking distance postoperative was reported and follow up MRI studies were done one year after the operation.

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Results: Operated patients' mean age was 58.2 years; nineteen patients were operated upon for simple decompressive laminectomy for the affected levels. Walking distance preoperative range 100–700 metres, improved postoperative to be 1474.0 ± 601.1. VAS for pain preoperative was 9.28 ± 0.84, improved at 12 month follow up to be 0.84 ± 0.62. Postoperative MRI done to evaluate the cross sectional area (CSA) became more than 80 mm^2 in the absence of the sedimentation sign and was negative in 22 cases.

Conclusion: The MRI finding of positive sedimentation sign is a good positive sign to rule in lumbar spinal stenosis with high specificity and sensitivity; negative sedimentation sign can be used in postoperative follow up of decompression patients.

Contents

1. Introduction

Lumbar spinal stenosis (LSS) is increasingly being recognised as a cause of disabling low back pain and lower extremities pain in adult population. A decrease in spinal canal volume has many causes like congenital abnormalities, disc herniation, and other space occupying lesions causing a decrease in spinal canal volume. The clinical syndrome of lumbar spinal stenosis most commonly occurs secondary to age related changes in the lumbar spine. Encroachment of the spinal canal in combination with residual motion leads to vascular and conduction changes in the neural elements thought to be responsible for clinical symptoms [1].

The clinical symptoms and signs include low back pain (95%), claudication (91%), leg pain (71%), weakness (33%) and voiding difficulties (12%). The typical symptoms for spinal stenosis are neurogenic claudication; include paresthesia and numbness in posterolateral legs and thighs. These symptoms are classically exacerbated with walking. Extension of the lumbar spine causes a decrease in the cross-sectional area (CSA) of the spinal canal therefore symptoms worsened in the upright position [1].

The use of advanced spinal imaging was thought as confirmation tool for the diagnosis of the stenosis and as preoperative tool to delineate the extent and precise location of the pathology. Myelography was the gold slandered in the evaluation of lumbar disc disease and stenosis, and this has been supplemented with the MRI, which is non-invasive and provides a highly detailed, multi-planner view of the spinal canal. Axial images may better demonstrate thecal sac compression and lateral recess narrowing which in turn is better to be diagnosed by CT scan because the osteophyte formation at the lateral recess around the facet joint has low signal intensity in T1 and T2 weighted images, thus MRI tends to over read the degree of encroachment [1,3].

The diagnostic difficulties of lumbar canal stenosis lie in the frequent absence of clinical symptoms at rest because pain and limited function occur only with physical activity. Conventional clinical scores correlate poorly with the grade of stenosis and the CSA of the dural sac in the MRI [4].

Static examinations such as forced hyperextension do not sufficiently reflect the situation during physical activity [5]. However, under and over diagnosis of LSS are common when using CSA as a discriminator. Under diagnosis is observed in patients with (a) foraminal stenosis, (b) dynamic stenosis during physical activity, and (c) rapidly progressing stenosis. Over diagnosis appears in patients with a higher age who demonstrate clinical symptoms not related to LSS but show a pathologic CSA [6].

A positive sedimentation sign was defined as the absence of nerve root sedimentation in at least 1 axial MRI scan, at a level above or below, disregarding the location of the scan within the level and its proximity to the maximal stenosis (Fig. 1). It is not uncommon for a sign to refer to the absence of a finding, e.g., the positive Thompson test in which the absence of plantar flexion helps to confirm the diagnosis of an Achilles tendon rupture. As a rule, nerve roots normally sediment, due to gravity, to the dorsal part of the dural sac, which was defined as negative sedimentation sign. The only exception from this is the 2 nerve roots leaving the dural sac one segmental level below the stenosis. If there are nerve roots in the ventral part of the dural sac except for the ones exiting the dural sac, the sedimentation sign is positive. By this method, no intermediate or indeterminate results of the sedimentation sign are to be expected. The sedimentation sign was measured at a level above or below the maximal stenosis because, at the level