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Dynamic change of dural sac cross-sectional area in axial loaded magnetic resonance imaging correlates with the severity of clinical symptoms in patients with lumbar spinal canal stenosis.

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Source

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Abstract

STUDY DESIGN:

Cross-sectional registry and imaging cohort study. OBJECTIVE.: To examine whether the dural sac cross-sectional area (DCSA) in axial loaded magnetic resonance imaging (MRI) correlates with the severity of clinical symptoms in patients with lumbar spinal canal stenosis (LSCS).

SUMMARY OF BACKGROUND DATA:

Many studies have analyzed the relationship between DCSA on conventional MRI and the severity of symptoms in LSCS, but the link is still uncertain. Recently, axial loaded MRI, which can stimulate the spinal canal of patients in the upright position, has been developed. Axial loaded MRI demonstrates significant reduction of DCSA and provides valuable radiologic findings in the assessment of LSCS. However, there has been no study of the correlation between DCSA in axial loaded MRI and the severity of symptoms in LSCS.

METHODS:

In 88 patients with LSCS, DCSA in conventional MRI, axial loaded MRI, and changes in the DCSA were determined at the single most constricted intervertebral level. The severity of symptoms was evaluated on the basis of the duration of symptoms, walking distance, visual analogue scale of leg pain/numbness, and Japanese Orthopedic Association score. Spearman correlations of the DCSA in conventional MRI, axial loaded MRI, and changes in the DCSA with the severity of symptoms were analyzed. In addition, the severity of symptoms and DCSA in conventional and axial loaded MRI were compared, respectively, between patients with and without significant (>15 mm) changes in the DCSA.

RESULTS:

The DCSA in axial loaded MRI had good correlations with walking distance and Japanese Orthopedic Association score ($r_s = 0.46$ and 0.45 , respectively; $P < 0.001$). In addition, the change in the DCSA significantly correlated to walking distance, visual analogue scale of leg numbness, and Japanese Orthopedic Association score ($r_s = 0.59$, 0.44 , and 0.54 , respectively; $P < 0.001$). Furthermore, the symptoms were significantly worse in patients with more than 15 mm change in the DCSA ($P < 0.001$). Axial loaded MRI, but not conventional MRI, showed a significantly smaller DCSA in patients with more than 15 mm change in the DCSA ($P < 0.05$).

CONCLUSION:

DCSA in axial loaded MRI significantly correlated with the severity of symptoms. Axial loaded MRI demonstrated that changes in the DCSA significantly correlated with the severity of symptoms, which conventional MRI could not detect. Thus, MRI with axial loading provides more valuable information than the conventional MRI for assessing patients with LSCS.

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