Congenital Cervical Spine Stenosis in a Global Cohort of Patients with Degenerative Cervical Myelopathy: A Report Based on a MRI Diagnostic Criterion

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Introduction

Congenital Spinal Stenosis (CSS) is a known predisposing factor for Degenerative Cervical Myelopathy (DCM). Previous studies have suggested that an AP canal diameter less than 12-13mm or a Torg-Pavlov ratio (TPR) of <0.82 are indicative of CSS. However, these studies are based on radiographs and cadaver studies, and do not take into account the variability in the spinal cord size between individuals. In a global cohort of patients with DCM, MRI-based criteria were developed to diagnose patients with pre-existing CSS. Furthermore, patient characteristics and surgical outcomes were compared between patients with and without CSS.

Methods

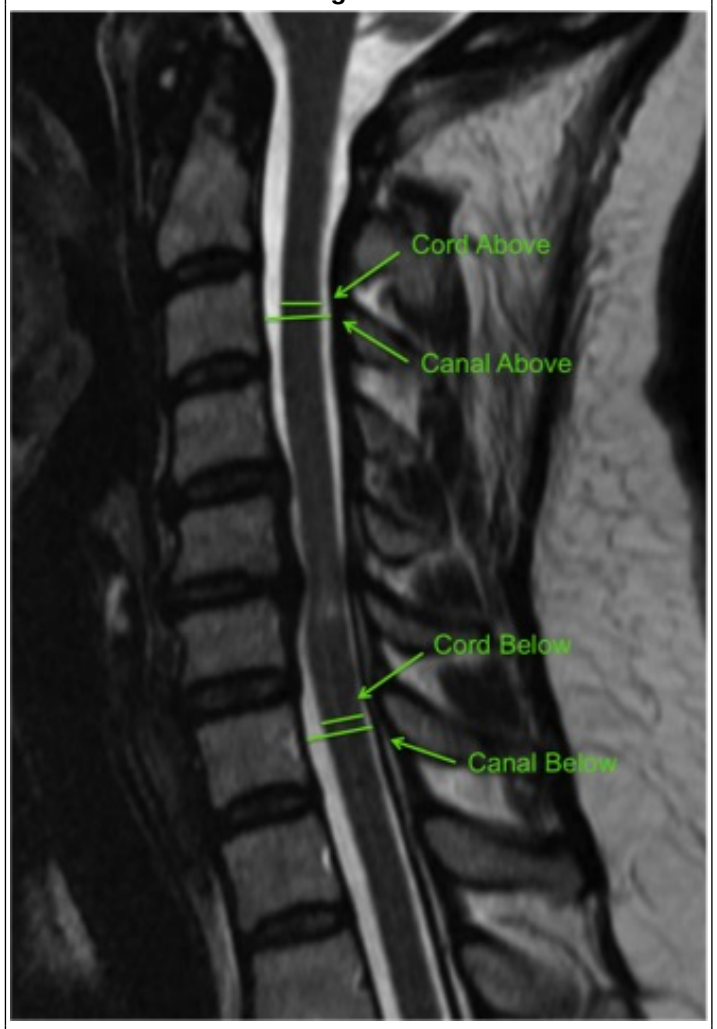
Study data (including 349 MRIs for quantitative analysis) were derived from two international prospective and multicenter studies. Spinal canal and cord anteroposterior diameters were measured above and below the region of interest at non-compressed sites, and a spinal cord occupation ratio (SCOR) was calculated. A SCOR of equal or greater than 70% was used to diagnose patients with CSS. The spinal canal diameter and Torg-Pavlov ratio were also assessed at C3 and C5 for patients with available radiographs. Clinical and MRI factors were compared between patients with and those without CSS using t-tests. Multiple linear regression was used to assess the impact of CSS on surgical outcome.

Figure 1

$$SCOR = \left(\frac{Cord\,Above + Cord\,Below}{Canal\,Above + Canal\,Below} \right) X100$$

SCOR Equation

Figure 2



Spinal Cord Occupation Ratio (SCOR) measurements on MRI.

Results

Calculation of SCOR was feasible in 311/349 patients (89%). Twenty-six patients with CSS were identified (8.4%). Patients with CSS were younger than patients without CSS (50.8 vs. 56.3, p=0.03) and had worse baseline severity as measured by the mJOA (p=0.04), Nurick (p=0.05) and NDI (p<0.01). CSS patients also presented more commonly with T2 cord hyperintensity changes (p=0.09), and worse SF-36 Physical Component scores (p=0.06), though these factors did not reach statistical significance. SCOR was correlated with Torg-Pavlov ratio and spinal canal diameter at C3, where degeneration is limited, but was not correlated at C5, where degeneration is common.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) Describe how to determine pre-existing congenital cervical stenosis in patients with DCM using MRI, 2) Discuss how congenital cervical stenosis in the setting of DCM affects the clinical presentation and surgical outcome.

References

(1) Nouri et al (2016) Magnetic Resonance Imaging Analysis of the Combined AOSpine North America and International Studies, Part I: The Prevalence and Spectrum of Pathologies in a Global Cohort of Patients With Degenerative Cervical Myelopathy. Neurosurgery. 2016 Aug;63 Suppl 1:191-2.

(2) Nouri et al (2016) Magnetic resonance imaging assessment of degenerative cervical myelopathy: a review of structural changes and measurement techniques. Neurosurg Focus. 2016 Jun;40(6):E5.

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Conclusions

CSS patients develop myelopathy at a younger age and have greater impairment and disability than other patients with DCM. Despite this, CSS patients have comparable duration of symptoms, MRI presentations, and surgical outcomes to DCM patients without CSS.